



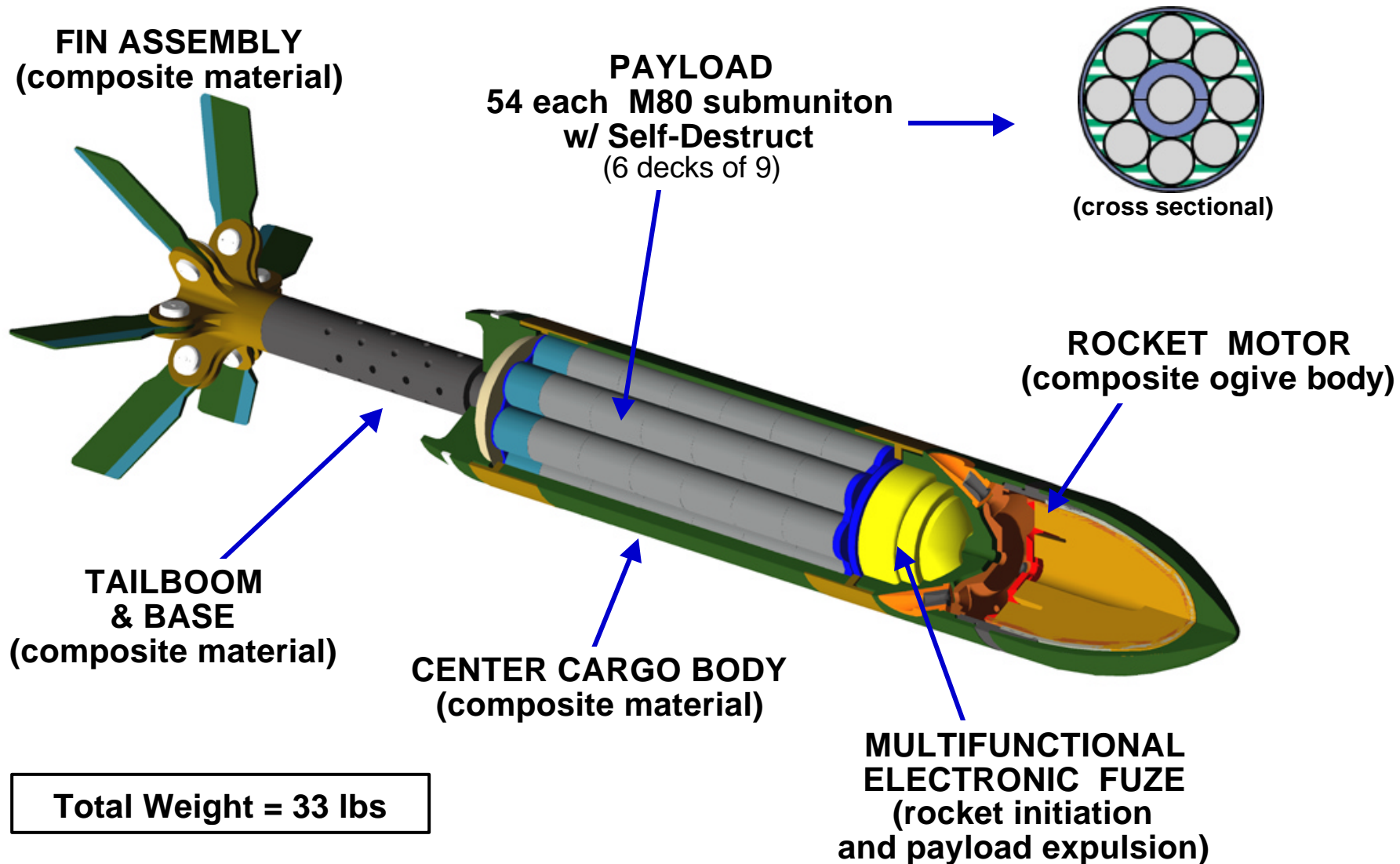
2002 International Infantry & Small Arms Symposium, Exhibition & Firing Demonstration

XM984 120mm Mortar Cartridge Extended Range DPICM

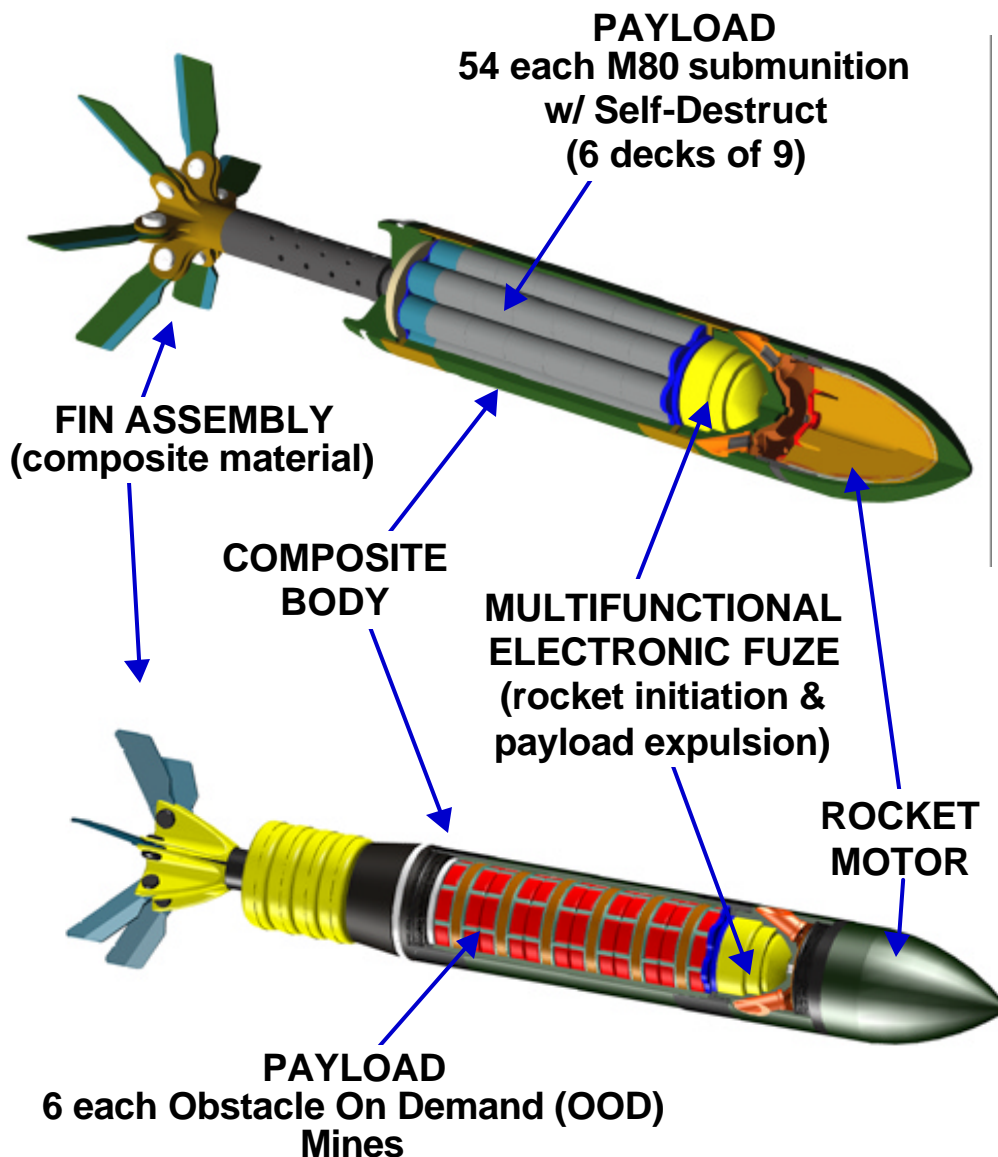
May 14, 2002

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XM984 ER-DPICM 120mm Mortar Cartridge



Extended Range 120mm Cargo Mmunition



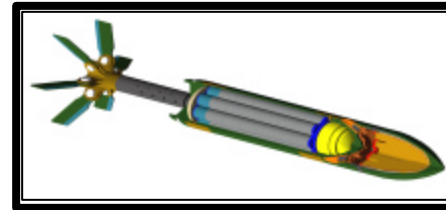
Description

- 120mm cargo carrying round
- Rocket Assist for Extended Range
 - 11 km range -- 52% Increase Vs Conventional
 - 233% Area Coverage Increase Vs Conventional
- Enhanced Lethality
 - 54 M80 DPICM Submunitions with Self Destruct Fuze
 - 82% Greater Anti-personnel Effectiveness
- Multifunction Electronic Fuzing
- Generic Configuration
 - Accommodates a Wide Variety of Payloads, include Unitary, Smoke, Illumination, SFM, Thermobaric, Mines and Non-Lethal.

XM984 ER-DPICM 120mm Mortar Cartridge

STO Goal: Develop and demonstrate a 120mm DPICM carrying Mortar Cartridge having significantly greater range capability and lethal effectiveness than currently attained

Capability	Current Capability standard 120mm	USAIC Req't XM 984
Weight	30 lbs	33 lbs
Max Range	7.2 km	10 - 12 km



Live-Fire Structural Integrity Test



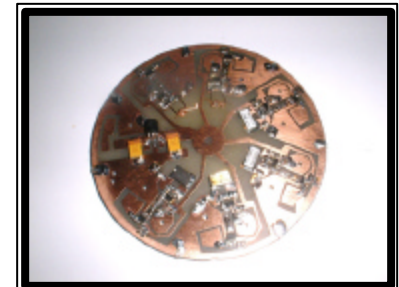
Rocket Propulsion of XM984 in Flight

STO Accomplishments:

- Successful range flight demo test confirming rocket motor and exterior ballistic performance to 8.7 km (23% greater than US fielded mortar).
- Critical composite airframe components of cargo body and rocket motor ogive survived high-G launch live fire.
- Rocket motor interior ballistic characterization data to achieve extended range. Six-degree of freedom (6 DOF) modeling data predicts an 12 km range with time of flight of 60 sec.
- On-board VMRI sensors to measure muzzle velocity during high-G environment in air gun.



Test Hardware



VMRI Crystal Test Fixture

**STO Ended in FY01:
TRL 5**

Characteristics

- Range 12 km
- Weight 33 lbs
- Length 37 inches
- Payload 54 each M80 grenades
- Body Material lightweight composites
- Rocket Motor
 - Material resin transfer composite
 - Grain Weight 3.86 lbm.

XM984 ER-DPICM 120mm Mortar Cartridge

Operation:

ROCKET BURN
(4 sec)

IGNITION
DELAY
(12 sec)

M934 Range to 7 KM

Timed Expulsion
Ejects Payload of
54 ea M80 Grenades

**Increased
Lethality**

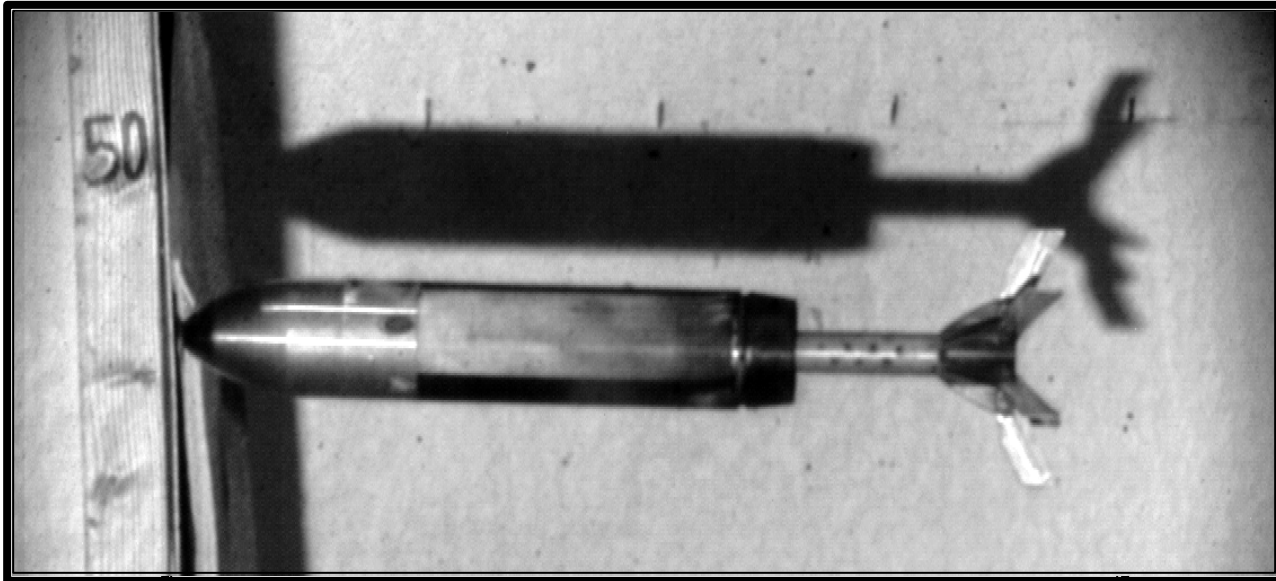
Rocket Assist Extends Range to 12 KM

Status

- Completed last year of its Science & Technology Objective (STO) program (RDT&E Line # 6.2)
- Summary of STO program
 - ✓ Level-2 Technical Data Package (3D Pro-E)
 - ✓ Rocket Motor Interior Ballistic Characterization via static live fire
 - ✓ Six-Degree of Freedom (6-DOF) modeling data
 - ✓ Structural Integrity at high-G environment of composite components via live fire at top charge
 - ✓ Live fire tested design of spring actuated 6-Fin Assembly
 - ✓ Structural Integrity at high-G environment of VMRI precision device via airgun test
 - ✓ Range Flight Test Demo @ Yuma Proving Ground

XM984 ER-DPICM 120mm Mortar Cartridge

Flat-Angle Live Fire Test – 22 Oct 2001



Test Round in flight 50 feet from muzzle

Objective: To determine structural integrity of redesigned rocket motor components under setback environment of live fire.

- Muzzle velocity: 326.1 m/s
- Chamber pressure: 12,012 psi
- Top zone charge (4)
- Good obturation observed from Fast-X camera
- Good fin deployment
- Stable flight (low angle of attack)

XM984 ER-DPICM 120mm Mortar Cartridge

Static Rocket Tests ***29 August 2001***



Firing No. SK7694-E-12

XM984 ER-DPICM 120mm Mortar Cartridge

YPG Flight Test – 11 October 2001 Video of First Test Round (TRN-3124)

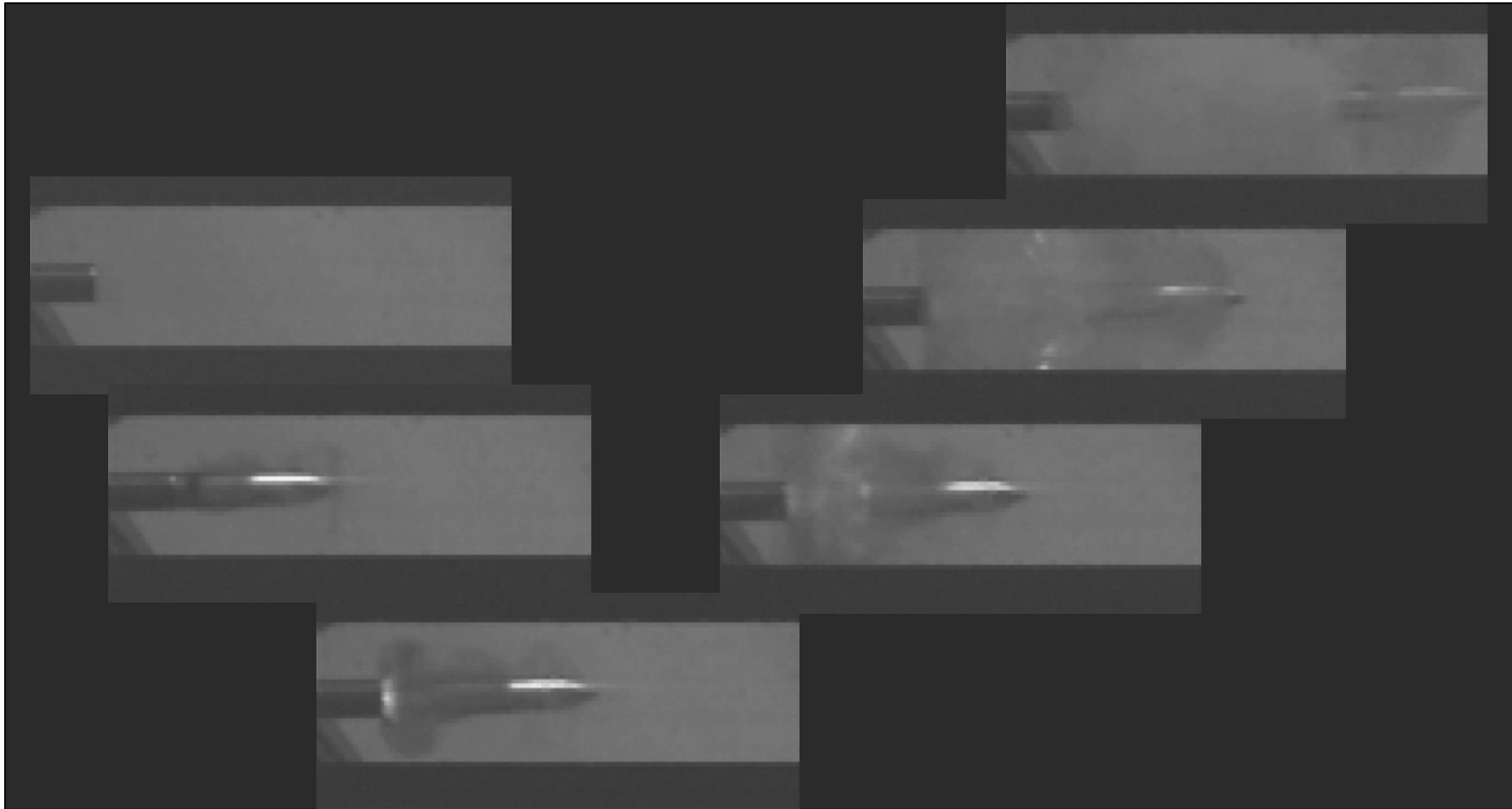


**High Speed Video
XM984 Rocket Motor Function**

XM984 ER-DPICM 120mm Mortar Cartridge

YPG Flight Test – 11 October 2001

Obturation of Third Test Round (TRN-3126)



XM984 ER-DPICM 120mm Mortar Cartridge

YPG Flight Test – Recovery



Recovered Test Rounds



Intact Fin Assembly from Test Rnd #1

YPG Flight Test – Exit Criteria

- ✓ **Demonstrate increased range performance from 5.4 to 8.8 Km +/- 10%.**
- ✓ **Normal functioning of rocket Motor and flight trajectory.**

Range Growth Potentials

- **Optimize rocket propellant + 0.4-0.6 Km**
- **Increase rocket motor length + 1.0 Km**
- **Reduce air frame drag + 1.0 Km**

XM984 ER-DPICM 120mm Mortar Cartridge

YPG Flight Test – Official Test Data

Flight Performance

Rd #	Rocket Delay	Muzzle Velocity		RANGE	DEFL	L / R	TIME	
		Weibal	Mark V				TOF	STDV
3124	6	330.9	330.6	7823	36	R	58.54	.30
3125	6	331.4	331.5	7835	12	L	57.05	.23
3126	12	330.1	330.5	8670	234	L	58.73	.00

Rocket Motor

Rd #	Rocket Motor Ignition	Rocket Motor Burn-out	Motor Burn Time	Velocity at Ignition	Velocity at Burn-out
3124	6.3	9.4	3.1	205.0	328.0
3125	6.0	9.0	3.0	211.0	330.0
3126	11.95	15.06	3.1	144.0	283.0

Range increase by 23% over standard 120mm mortar

Continued Development

- Refine rocket motor design to deliver better thrust impulse and reduce airframe drag for extended range test at YPG
- Continue proof-of-principle efforts for the Velocity Measurement / Rocket Ignition (VMRI)
- Process design and fabrication of composite base, tailboom, and fin assembly
- Engineering bench tests of expulsion charge system
- Fabrication and testing prototype multi-function fuze
- Development of pattern distribution system for submunition

Summary

- **APPROVED REQUIREMENT**
- **IMPROVED SURVIVABILITY**
- **INCREASED EFFECTIVENESS**
- **REDUCED LOGISTICS BURDEN**
- **ENHANCED PRECISION**
- **SYSTEM COMPATIBILITY**
- **ACCOMODATES VARIOUS PAYLOADS**
- **LOW COST**
- **PROVEN DESIGN CONFIGURATION**